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Dated: July 7, 2003

Signature: Bryan J. Lempia
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#26

Appeal Brief
DSma 11s-Logan
11-17-03

Attorney Docket No.: 27754/35306A
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Paul R. Drury

Application No.: 09/426,087

Group Art Unit: 2861

Filed: October 22, 1999

Examiner: Kristal J. Feggins

For: Droplet Deposition Apparatus

APPELLANTS' BRIEF

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Alexandria, VA 22313-1450

Dear Sir:

This brief is in furtherance of the Notice of Appeal, filed in this case on April 28, 2003, and *received* by the United States Patent & Trademark Office on May 5, 2003. Thus, this Appellants' Brief is timely filed on this day, Monday, July 7, 2003, which is the first business day within two months from the date of the appeal.

The fees required under §1.17(f) are dealt within in the accompanying Transmittal of Appeal Brief. No extension of time fee is believed due to accompany this Appellants' Brief.

This brief is transmitted in triplicate.

This brief contains items under the following headings as required by 37 C.F.R. §1.192 and M.P.E.P. §1206:

- I. Real Party In Interest
- II. Status of Claims
- III. Status of Amendments
- IV. Summary of Invention

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- V. Issues
- VI. Grouping of Claims
- VII. Arguments
- VIII. Claims Involved in the Appeal
- Appendix A Claims

I. REAL PARTY IN INTEREST

The present application has been assigned to Xaar Technology Limited of Cambridge, England. Evidence of the assignment was recorded on January 27, 2000, at Reel 010604, Frame 0496.

II. STATUS OF CLAIMS

Claims 1-17 have been finally rejected in an official action dated November 26, 2002 as follows:

- A. Claims 1-3, 6, 8, 9, and 12 have been rejected under 35 U.S.C. §102(b) as anticipated by Michaelis et al., EP 0 277 703 A1 (Michaelis).
- B. Claims 13 and 15-17 have been rejected under 35 U.S.C. §102(e) as anticipated by Aoki, U.S. Patent No. 5,976,303 (Aoki).
- C. Claims 4, 5, and 7 have been rejected under 35 U.S.C. §103(a) as obvious over Michaelis in view of Allen et al., EP 0 564 102 A2 (Allen).
- D. Claims 10 and 11 have been rejected as obvious over Michaelis in view of Aoki.
- E. Claim 14 has been rejected as obvious over Aoki in view of Silverbrook, U.S. Patent No. 6,171,875 (Silverbrook).

III. STATUS OF AMENDMENTS

A preliminary amendment was submitted with the application on October 22, 1999. The preliminary amendment has been entered and considered.

An amendment was filed on June 28, 2001 in response to a first official action dated February 28, 2001. That amendment was entered and considered.

An amendment was submitted on December 3, 2001 in response to a first *final* official action dated October 3, 2001. That amendment was entered and considered, and the finality of the action, as requested, was withdrawn.

An amendment was submitted on September 3, 2002 in response to a non-final official action dated May 31, 2002. That amendment was entered and considered.

An amendment was submitted on March 26, 2003 in response to a second *final* official action dated November 26, 2002, from which this appeal is taken.¹ That amendment will be entered upon this appeal, as indicated in an advisory action mailed on April 15, 2003. The advisory action also alleges that the amendment of March 26, 2003 does not place the application in condition for allowance. The appellants have submitted this Appellants' Brief in appealing the decision in the second final action of March 26, 2003.

All amendments submitted to date have been entered. No amendments remain outstanding or unentered. Further, no amendments accompany this Appellants' Brief.

IV. SUMMARY OF INVENTION

The present application is directed to a droplet deposition apparatus. In one embodiment, the apparatus has a fluid chamber with actuator means that is actuatable by electrical signals to effect ejection of droplets from the fluid chamber through a nozzle. The apparatus also has a drive circuit means for applying the electrical signals to the actuator means. The apparatus further includes conduit means for conveying droplet fluid to and from the fluid chamber wherein the drive circuit means is in substantial thermal contact with the conduit means so as to transfer a substantial part of the heat generated in the drive circuit to the droplet fluid.

¹ The examiner kindly agreed to conduct an interview in this case, which took place on March 20, 2003. However, no resolution was reached as to the allowability of any of the claims.

In another embodiment, a droplet deposition apparatus has at least one droplet ejection unit comprising a plurality of fluid chambers, actuator means, and a plurality of nozzles arranged in a row. The actuator means are actuatable to eject a droplet of fluid from a fluid chamber through a respective nozzle. The apparatus also has a support member for the at least one droplet ejection unit, wherein the support member has at least one droplet fluid passageway communicating with the plurality of fluid chambers. The at least one droplet fluid passageway is arranged to convey droplet fluid at least from the fluid chambers in a direction substantially parallel to the nozzle row and to transfer a substantial part of the heat generated during droplet ejection to the conveyed droplet fluid.

In an additional embodiment, a droplet deposition apparatus has a fluid chamber, at least part of which is formed from a first material which has a first coefficient of thermal expansion. The fluid chamber is associated with an actuator means which is actuatable to eject a droplet from the chamber. The chamber also has a port for the inlet of droplet fluid to the chamber. The apparatus also has a support member for the fluid chamber and the support member has a passageway for supply of droplet fluid to the port. The support member is defined at least in part by a second material which has a second coefficient of thermal expansion that is greater than the first coefficient of thermal expansion of the material which forms at least part of the fluid chamber. The apparatus also has a means for attaching the fluid chamber to the support member in order to substantially avoid transfer of thermal deformation of the support member to the fluid chamber.

V. ISSUES

- A. Whether Michaelis discloses all of the limitation of claims 1-3, 6, 8, 9, and 12?
- B. Whether Aoki discloses all the limitations of claims 13 and 15-17?
- C. Whether a combination of Michaelis and Allen teaches or suggests all of the limitations of claims 4, 5, and 7?
- D. Whether a combination of Michaelis and Aoki teaches or suggests all of the limitations of claims 10 and 11?

E. Whether a combination of Aoki and Silverbrook teaches or suggests all of the limitations of claim 14?

VI. GROUPING OF CLAIMS

For the purpose of this Appellants' Brief only, and without conceding the teachings of any prior art reference, the claims have been grouped as indicated below:

Group Claim(s)

- A. Claims 1-5 will stand or fall together.
- B. Claims 6-12 will stand or fall together.
- C. Claims 13-17 will stand or fall together.

In Section VII below, the appellants have included arguments supporting the separate patentability of each claim group as required by M.P.E.P. §1206.

VII. ARGUMENTS

Regarding anticipation, a single prior must teach all of the rejected claim limitations. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference."² If this requirement is not met, anticipation has not been established. The appellants believe that the cited anticipatory references, Michaelis and Aoki, do not teach all of the rejected claim limitations, as set forth below.

Regarding obviousness, a procedural tool of examination has been established for allocating which party has the burden of proffering evidence at each stage of the prosecution process. A proper *prima facie* case of obviousness must first be established by the Patent Office and, if not established, without more, an applicant is entitled to grant of a patent.³ A *prima facie* case of obviousness requires: a) that a combination of two prior art references teaches all of the rejected claim limitations; b) that there would have been a reasonable expectation of success in making the combination as proposed by the examiner; and, c) that the suggestion or motivation to combine the reference teachings, as proposed in

² *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

³ *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

the rejection, must be found only in the prior art.⁴ If any one of these requirements is not met, *prima facie* obviousness has not been established. The appellants believe that *prima facie* obviousness cannot be established in this application based on any combination of the cited references.

Particularly, the cited references, Michaelis, Aoki, Allen, and Silverbrook, whether taken alone or in combination, fail to teach all of the claim limitations as set forth below. Though we have not addressed either the motivation or suggestion to combine reference teachings or whether there would be a reasonable expectation of success in doing so, the applicant does not concede that such a motivation or a reasonable expectation exist. To the contrary, though these points are not addressed, the appellants believe that neither of these additional two *prima facie* requirements can be met in view of the cited references.

A. Michaelis Does Not Anticipate Claims 1-3, 6, 8, 9, and 12.

1. Claims 1-3

Independent claim 1 has been rejected as anticipated by Michaelis. To the contrary, Michaelis fails to disclose all of the limitations of claim 1.

Claim 1 recites a *fluid chamber*, which is shown and described in the specification, for example, as channels 11. See page 8, lines 24-31, and FIG. 5 of the specification. Claim 1 also recites that the chambers (channels) have *actuator means*, which in the disclosed examples are the channel walls of piezoelectric material covered with electrodes. The actuator means are actuatable by electrical signals to effect ejection of droplets from the fluid chamber through a nozzle. The electrodes are coated on the walls of the channels 11. See page 8, lines 24-31, and FIG. 5 of the specification.

Claim 1 further recites a *drive circuit means* (circuit chip 50, flexible circuit 60, drive circuit dies 360, 370) for supplying the electrical signals to the actuator means (electrodes). See, for example, page 6, lines 11-15, and FIGS. 1 and 3 of the specification. The drive circuit provides the signals to actuate the electrodes. The *actuator means* and the *drive circuit means* are two completely different, distinct elements of the claimed apparatus.

⁴ *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Claim 1 also recites a *conduit means* (ink flow passages 210, 220, 230) for conveying droplet fluid both *to and from* the fluid chamber. See, for example, page 6, lines 17-32, and FIGS. 2 and 3 of the specification. It is clear from claim 1 and the specification that the conduit means, the channel or fluid chamber, and the ejection nozzle are each a different and distinct claimed element.

Claim 1 lastly recites that the *drive circuit means* is in *substantial thermal contact with said conduit means* so as to transfer a substantial part of the heat generated in said drive circuit to said droplet fluid. The conduit means is not the chamber or channel, and the droplet fluid in the conduit means is not the fluid in the channel or chamber being ejected from the nozzle. Claim 1 clearly recites a rather specific structural and functional arrangement of apparatus components.

Michaelis admittedly discloses: a) channels or chambers 613; b) electrodes or actuator means (actuator walls 603) in the channels; c) ejection nozzles 618 in the channels; d) liquid supply means (tube 42, reservoir 44) for supplying ink to the channels 613; and, e) a drive circuit means 625 for supplying the signals to the actuators 603. *However, Michaelis fails to disclose or suggest the specifically claimed apparatus construction and arrangement.*

The entire rejection is based on equating the claimed conduit means to the Michaelis ink channels or chambers 613, and based on equating the claimed drive circuit means to the Michaelis electrodes 603. These assumptions are clearly erroneous as illustrated below.

For example, Michaelis does not disclose or suggest any means, much less a conduit means that is distinct from its channels 613, for conveying fluid *both to and from* a fluid chamber, as is required by claim 1. Further, Michaelis does not disclose or suggest any means to convey fluid from the channels 613, other than the ejection nozzles. In Michaelis, ink is only conveyed from the reservoir 44 via the tube 42 to the chambers 613, and ink is only ejected from the channels 613 via the nozzles. Claim 1 differentiates between ejection via nozzles from the chamber or channel and conveying droplet fluid via the conduit means *from* the chamber or channel. *Neither the tube 42 nor the channels 613 equates to the recited conduit means.*

Additionally, Michaelis does not disclose or suggest that its drive circuit 625 is in substantial thermal contact with any part of the Michaelis apparatus, much less a conduit means as recited in claim 1. Instead, Michaelis, at col. 10, lines 1-17, describes only that its *electrodes* or shear mode actuators 603 are within and define part of the chambers or channels 613, which would contact ink therein. However, neither this excerpt, nor any other part of Michaelis, refers to placement of its drive circuit 625 to be in thermal contact with conveyed ink. Further, no part

of Michaelis teaches that the drive circuit 625 is disposed in *substantial thermal contact* with any part of the device disclosed therein. Even if the Michaelis electrodes 603 are incorrectly equated to the claimed drive circuit means, as the examiner has asserted, the electrodes 603 are not in thermal contact with a discrete conduit means that is different from its chambers 613. Claim 1 clearly distinguishes between the chamber or fluid channel and the conduit means.

Michaelis fails to teach or suggest all of the limitations of claim 1. Independent claim 1 and corresponding dependent claims 2 and 3 are neither anticipated nor rendered obvious by Michaelis. This rejection should be withdrawn.

2. Claims 6, 8, 9, and 12

Independent claim 6 has been rejected as anticipated by Michaelis. To the contrary, Michaelis fails to disclose all of the limitations of claim 6.

Claim 6 recites at least one droplet ejection unit (unit 10) with a plurality of fluid chambers (channels 11). Claim 6 also recites actuator means (electrode walls of the channels 11) and a plurality of nozzles arranged in a row (rows 20 and 30). Claim 6 further recites that the actuator means (electrodes) are actuatable to eject a droplet of fluid *from* a fluid chamber (one channel 11) *through a respective nozzle*.

Claim 6, however, also recites additional limitations including a *support member* (supporting structure 200) for the at least one droplet ejection unit. The support member is recited as for supporting the *droplet ejection unit* (10). See page 6, lines 17-32, and FIG. 2, for example. Claim 6 further recites that the support member comprises at least one *droplet fluid passageway* (passages 210, 220, 230) that *communicates with* the plurality of fluid chambers. Thus, the recited droplet fluid passageway is different and distinct from the channels or chambers 11. Michaelis fails to disclose or suggest this limitation of claim 6.

Claim 6 additionally recites that the droplet fluid passageway is arranged so as to convey droplet fluid *from said fluid chambers* (channels 11) in a direction *substantially parallel* to (see arrow 100 in FIG. 1) the nozzle row (rows 20, 30). Claim 6 distinguishes between *ejection* from channels or chambers via nozzles and *conveyance* from the channels or chambers via the passageway. Michaelis does not disclose or suggest this limitation of claim 6. Lastly, claim 6 recites that the *passageway* (210, 220, 230) is arranged to *transfer a substantial part of the heat*

generated during droplet ejection to said conveyed droplet fluid. Michaelis also fails to disclose or suggest this limitation of claim 6.

The examiner's rejection is again incorrectly based on equating the recited droplet fluid passageway to the Michaelis channels or chambers 613, and based on equating the recited support member to the nozzle plate 617 of Michaelis. These assertions are erroneous as set forth below.

The Michaelis nozzle plate 617 does not have a fluid passageway that communicates with a plurality of fluid chambers and that conveys fluid *from* the chambers, as is recited in claim 6. Instead, the nozzle plate 617 has a plurality of conventional nozzles 618. Each nozzle only communicates with and ejects fluid from a single one of the channels 613. No nozzle 618, or any other part of the plate 617, communicates with *a plurality* of the channels 613 in Michaelis. Further, no other part of the Michaelis device can be equated to a support member for the channels 613. Thus, Michaelis fails to disclose or suggest a support member with a passageway communicating with a plurality of the chambers or channels, as is recited in claim 6.

Further, no passageway that is distinct from both the channels 613 and nozzles 618 in Michaelis is disclosed as being capable of conveying fluid from its chambers 613. Only the nozzles 618 eject fluid from the chambers 613. Further, no channel or tube, much less a fluid passageway as recited in claim 6, is disclosed in Michaelis as conveying fluid in a direction *that is parallel* to a row of the nozzles 618. In contrast, the supply tube 42 of Michaelis conveys fluid only to the channels 613, and only in a direction perpendicular to the row of nozzles 618. Also, the fluid ejection direction from a given nozzle is perpendicular to the row of nozzles. These are the antithesis of the parallel direction recited in claim 6. Thus, Michaelis fails to disclose or suggest these limitations of claim 6 as well.

Michaelis also fails to disclose or suggest a support member of any kind that is arranged to transfer heat generated during droplet ejection to any location, much less *to conveyed droplet fluids*, as is recited in claim 6. There is absolutely no disclosure within Michaelis as to heat transfer to any fluid from any structure. Even if, as the examiner has done, one were to assume that the electrodes 603 transfer heat to the droplet ejected from the nozzles 618, this does not meet the limitations recited in claim 6. To the contrary, claim 6 requires that heat be transferred to the fluid being conveyed from the chambers via the recited droplet fluid passageway, not to the fluid ejected from the recited nozzle row. Thus, Michaelis also fails to disclose or suggest this limitation of claim 6.

Michaelis fails to disclose or suggest all of the limitations of claim 6. Therefore, independent claim 6 and corresponding dependent claims 8, 9, and 12 are neither anticipated nor rendered obvious by Michaelis. This rejection should be withdrawn.

B. Aoki Does Not Anticipate Claims 13 and 15-17

Independent claim 13 has been rejected as anticipated by Aoki. To the contrary, Aoki fails to disclose all of the limitations of claim 13.

Claim 13 recites a fluid chamber (channel 11), wherein at least part of the **fluid chamber** is formed from a *first material* having a *first coefficient of thermal expansion*. Claim 13 also recites that the fluid chamber (channel 11) has a *port for the inlet* of droplet fluid to the chamber (inlet aperture 930).

Claim 13 also recites a *support member* (support structure 200) for the fluid chamber (channel 11). The support member (structure 200) is recited as including a *passageway for supply* of droplet fluid to the inlet port (aperture 930). Claim 13 additionally recites that the **support member** is defined at least in part by a *second material* having a *second coefficient of thermal expansion* that is greater than the first coefficient of the fluid chamber material.

Clearly, claim 13 is directed to a support member adapted to supply ink to the channels or fluid chambers, and the chambers are those adapted to eject ink or fluid therefrom. Aoki fails to disclose or suggest the specific structure recited in claim 13.

To illustrate, Aoki discloses attachment of a polyimide resin material nozzle plate 4 to a piezoelectric ceramic material actuator substrate 2 that defines fluid channels or chambers 3. Thus, Aoki discloses different materials and different coefficients of thermal expansion for these two components. The actuator substrate 2 in Aoki can be equated to the fluid chamber recited in claim 13. *However, the nozzle plate 4 in Aoki cannot be equated to the support member as claimed.* The claimed support member is recited as defining a passageway for supply of droplet fluid to the inlet port of the fluid chamber. In contrast, the Aoki nozzle plate 4 only provides nozzles 40 for ejection of fluid from the channels. Thus, the nozzle plate 4 does not meet all of the limitations of the recited support member.

To further illuminate this distinction, Aoki also discloses a *cover plate 8 with a supply opening 7*. Ink or fluid is supplied to the channels 3 via the opening 7 in the cover plate 8. The cover plate 8, for sake of argument, could be equated in some fashion to the claimed support

member because each of these structures *supplies* fluid to their respective channels or chambers. However, Aoki discloses that its cover plate 8 is formed from piezoelectric ceramic material at col. 3, lines 52-53. *Thus, the cover plate 8 in Aoki is formed from the exact same material as the actuator/channel substrate 2.* Aoki, therefore, fails to disclose or suggest a chamber or channel formed of one material as claimed and a support member with a supply passageway and formed of a second material as claimed.

Aoki fails to disclose or suggest at least these limitations of claim 13. Independent claim 13 and corresponding claims 15-17 are neither anticipated nor rendered obvious by Aoki. This rejection should be withdrawn.

C. Michaelis and Allen in Combination Do Not Render Obvious Claims
4, 5, and 7

Dependent claims 4, 5, and 7, which depend from either claim 1 or claim 6, have been rejected as obvious over Michaelis and Allen. The missing limitations of claims 1 and 6 with respect to Michaelis are discussed above. Allen fails to disclose or suggest these same limitations, and the examiner has made no such assertions.

The combination of Allen and Michaelis fails to disclose or suggest all of the limitations of independent claims 1 and 6. As a result, dependent claims 4, 5, and 7 are not rendered obvious by this cited art combination. This rejection should be withdrawn.

D. Michaelis and Aoki in Combination Do Not Render Obvious Claims
10 and 11

Dependent claims 10 and 11, which depend from claim 6, have been rejected as obvious over Michaelis and Aoki. The deficiencies in Michaelis with respect to claim 6 are discussed above. Aoki also fails to disclose or suggest at least the same missing limitations, and the examiner has made no such assertions.

The combination of Aoki and Michaelis fails to disclose or suggest all of the limitations of independent claim 6. As a result, dependent claims 10 and 11 are not rendered obvious by the cited art combination. This rejection should be withdrawn.

E. Aoki and Silverbrook in Combination Do Not Render Obvious Claim
14

Dependent claim 14, which depends from claim 13, has been rejected as obvious over Aoki and Silverbrook. The deficiencies in Aoki with respect to claim 13 are discussed above. Silverbrook also fails to disclose or suggest the same limitations, and the examiner has made no such assertion.

The combination of Aoki and Silverbrook, therefore, fails to disclose or suggest all of the limitations of independent claim 13 and, thus, dependent claim 14. This rejection should be withdrawn.

F. Claim Rejections Must Be Withdrawn

In view of the foregoing arguments, the rejections of claims 1-17 must be withdrawn. Claims 1-17 are in condition for allowance.

VIII. CLAIMS INVOLVED IN THE APPEAL

A copy of the claims involved in the present appeal is attached hereto as Appendix A. As indicated above, the claims in Appendix A include all of the previous amendments filed by Applicant and entered by the examiner to date in this application.

Dated: July 7, 2003

Respectfully submitted,

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APPENDIX A

Claims Involved in the Appeal of Application Serial No. 09/426,087

1. Droplet deposition apparatus comprising:

a fluid chamber having actuator means actuatable by electrical signals to effect ejection of droplets from the fluid chamber through a nozzle;

drive circuit means for supplying the electrical signals to the actuator means; and

conduit means for conveying droplet fluid to and from said fluid chamber, said drive circuit means being in substantial thermal contact with said conduit means so as to transfer a substantial part of the heat generated in said drive circuit to said droplet fluid.

2. Apparatus according to Claim 1, comprising first conduit means for supplying droplet fluid to said fluid chamber and second conduit means for leading droplet fluid from said fluid chamber.

3. Apparatus according to Claim 2, wherein said drive circuit means is thermally connected to the second conduit means.

4. Apparatus according to Claim 1, wherein the drive circuit is incorporated within an integrated circuit package of substantially cuboid form in which at least some of the faces are rectangles each having a surface area, a face other than that face having the smallest surface area being arranged so as to lie substantially parallel to the direction of fluid flow in that part of the conduit closest to said face, and to be in substantial thermal contact with the fluid.

5. Apparatus according to Claim 4, wherein the face having the greatest surface area is arranged so as to lie parallel to the direction of fluid flow.

6. Droplet deposition apparatus comprising:

at least one droplet ejection unit comprising a plurality of fluid chambers, actuator means and a plurality of nozzles arranged in a row, said actuator means being actuatable to eject a droplet of fluid from a fluid chamber through a respective nozzle; and

a support member for said at least one droplet ejection unit, said support member comprising at least one droplet fluid passageway communicating with said plurality of fluid chambers and arranged so as to convey droplet fluid from said fluid chambers in a direction substantially parallel to said nozzle row and to transfer a substantial part of the heat generated during droplet ejection to said conveyed droplet fluid.

7. Apparatus according to Claim 6, wherein the droplet fluid passageway occupies the majority of the cross-sectional area of the support member.

8. Apparatus according to Claim 6, wherein the droplet fluid passageway comprises respective portions for conducting droplet fluid into and away from each fluid chamber.

9. Apparatus according to Claim 6, wherein the cross-section of support member is wider in the direction of ink ejection from the nozzles than in the direction of the nozzle row.

10. Apparatus according to Claim 6, wherein the support member comprises material having a higher thermal conductivity than said at least one droplet ejection unit.

11. Apparatus according to Claim 10, comprising means for attaching said at least one droplet ejection unit to the support member in order to substantially avoid transferral of thermal deformation of the support member to said at least one droplet ejection unit.

12. Apparatus according to Claim 6, comprising a plurality of said droplet ejection units, the support member supporting the droplet ejection units side by side in the direction of the nozzle rows, the support member comprising at least one droplet fluid passageway communication with at least two of said ejection units and arranged so as to convey droplet fluid

to or from said ejection units in a direction substantially parallel to said nozzle rows and to transfer a substantial part of the heat generated during droplet ejection to said conveyed droplet fluid.

13. Droplet deposition apparatus comprising:

a fluid chamber, at least part of which is formed from a first material having a first coefficient of thermal expansion, said chamber being associated with actuator means actuatable to eject a droplet from the chamber and having a port for the inlet of droplet fluid thereto;

a support member for said fluid chamber and including a passageway for supply of droplet fluid to said port, the support member being defined at least in part by a second material having a second coefficient of thermal expansion greater than said first coefficient; and

means for attaching the fluid chamber to the support member in order to substantially avoid transfer of thermal deformation of the support member to said fluid chamber.

14. Apparatus according to Claim 14, wherein the attachment means comprises resilient bonding means for bonding the fluid chamber to the support member.

15. Apparatus according to Claim 13, wherein the or each fluid chamber comprises a channel formed in a body of piezoelectric material and closed by a cover member substantially thermally matched to the piezoelectric material.

16. Apparatus according to Claim 15, wherein ink supply ports are formed in said cover.

17. Apparatus according to Claim 15, wherein at least one ink ejection nozzle is formed in said body or piezoelectric material.